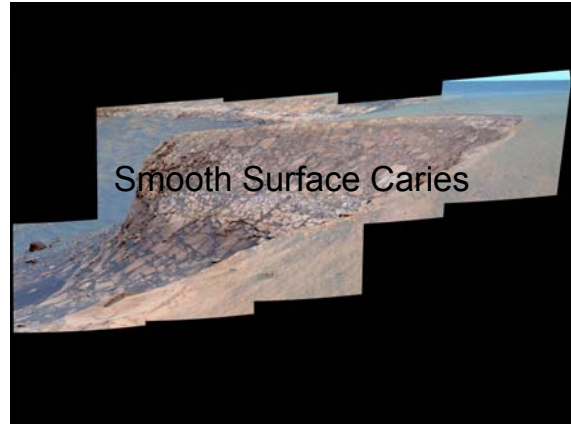


Histopathology of The Developing Caries Lesion



Gary Hildebrandt, DDS, MS
University of Minnesota
School of Dentistry

Smooth Surface Caries



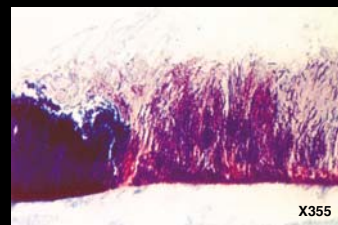
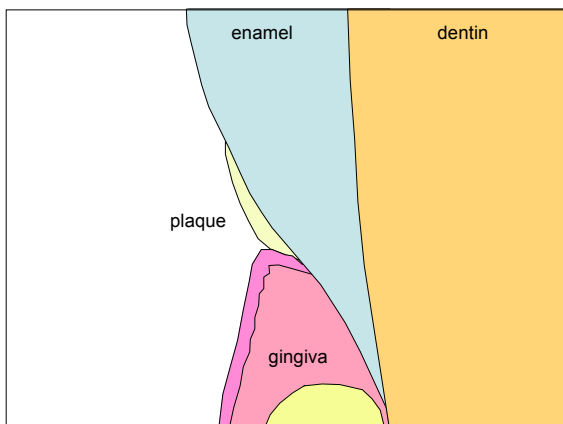
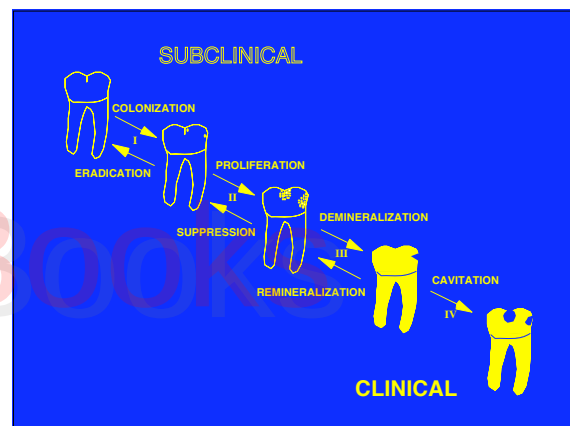
Etiology of Caries Lesion

Causative Factors

- Presence of caries pathogens (MS, LB)
- Frequent or prolonged exposure to fermentable carbohydrates

Potentiating Factors

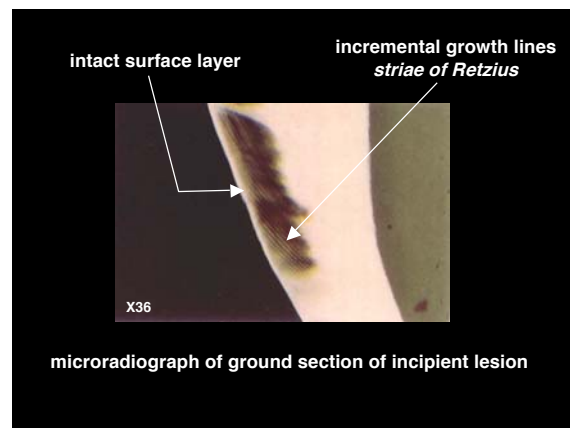
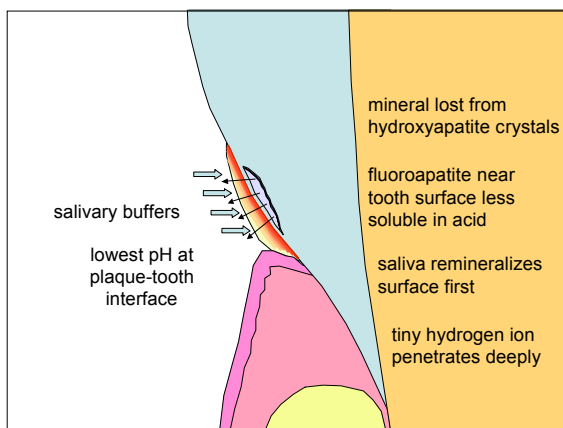
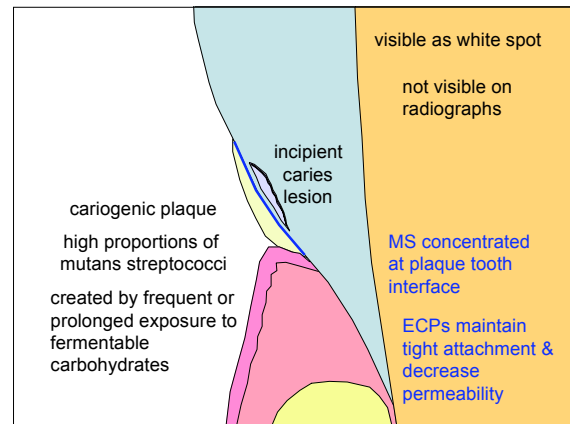
- Low fluoride exposure level
- Inadequate salivary flow

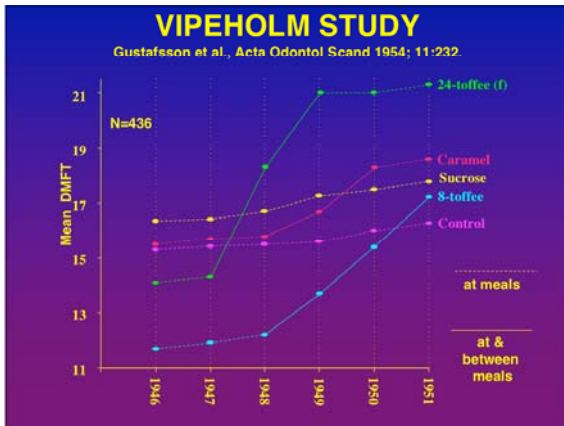


Gram stained plaque on enamel surface
(+ cocci, + filamentous, scattered - forms)

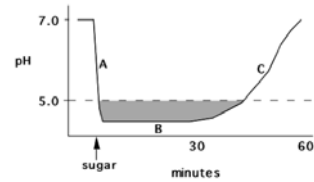
Lesion Initiation

- MS present in low numbers in plaque (carrier state)
- Frequent sugar supply gives MS competitive advantage
- ECP helps adhere them firmly to tooth surface
- Metabolism of sugar to acid byproducts lowers pH
- Few organisms can survive in low pH (aciduric)
- MS proportions increase
- This lowers the pH further and decreases the number of competing organisms
- Once the pH low enough (critical pH, 5.0-5.5) tooth mineral begins dissolving
- Mineral loss follows down the grain of the enamel rods





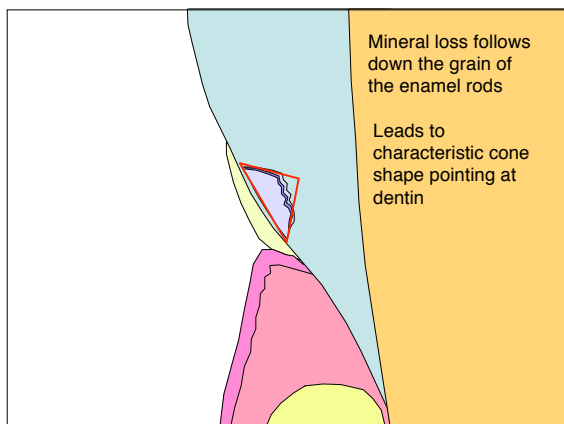
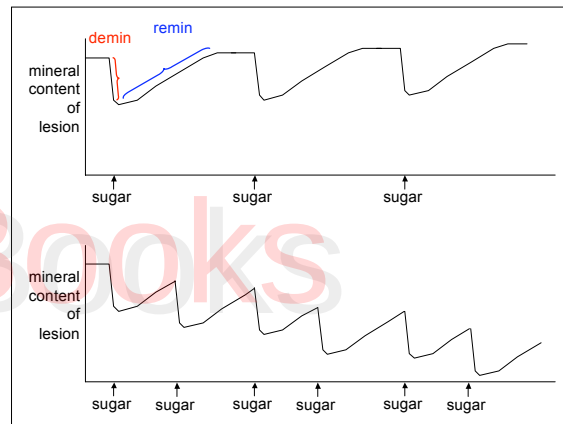
Stephan Curve (pH at plaque-tooth interface by time after sugar)



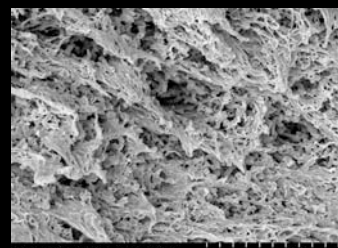
- A. rapid pH drop indicates sugar instantaneously converted to acids--overwhelming salivary buffers
- B. persistence of low pH (plateau) due to catabolism of ICP --can be >60 minutes
- C. gradual return to resting pH due to diffusion, dilution, & buffering of acid

Demin/Remin Cycling

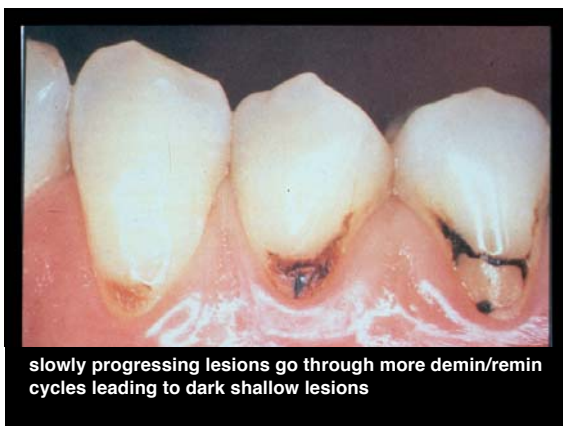
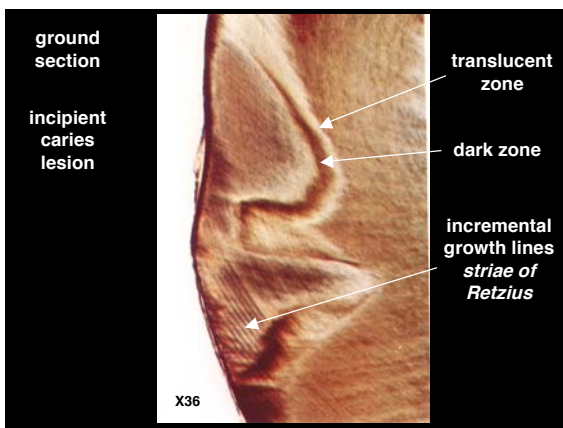
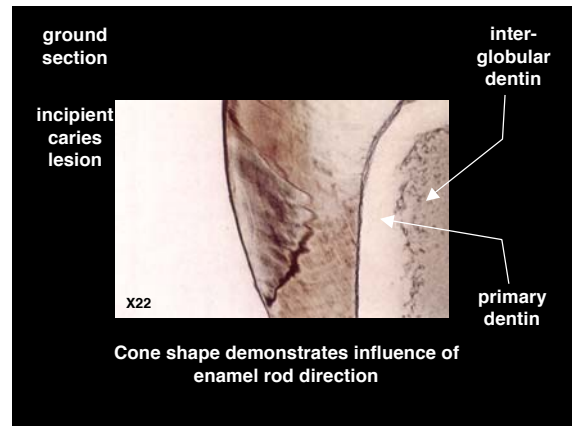
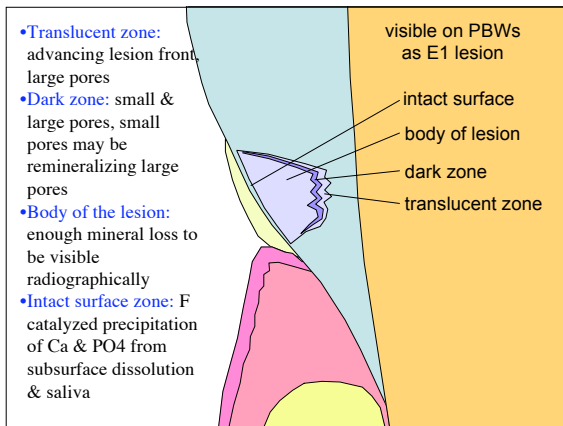
- Saliva dilutes & buffers acid & contains concentrated calcium & phosphate ions
- When sugar present, net demineralization rapidly occurs
- Between sugar episodes, remineralization slowly occurs
- If remin periods exceed demin periods, subsurface lesion will mineralize & arrest
- If demin periods exceed remin periods, cavitation will occur
- Demin periods exceed remin periods when sugar is frequent or prolonged

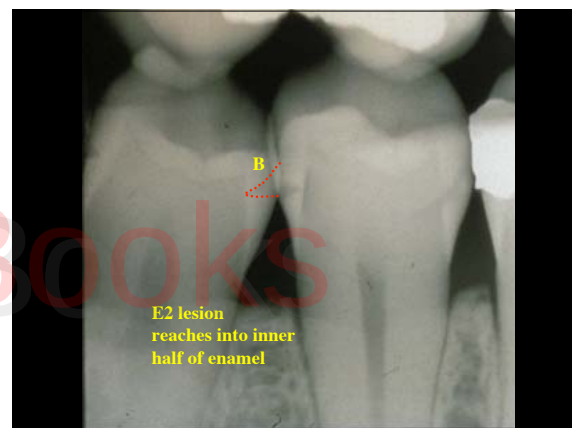
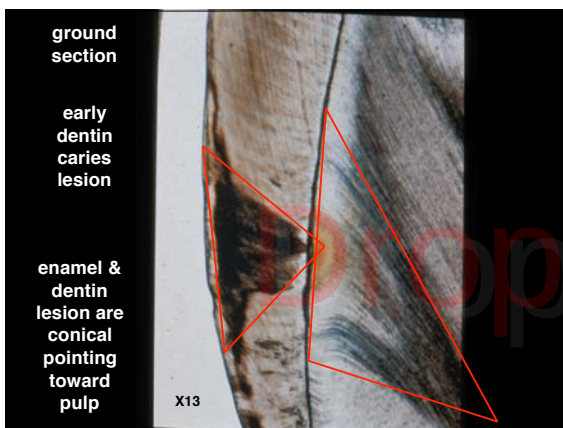
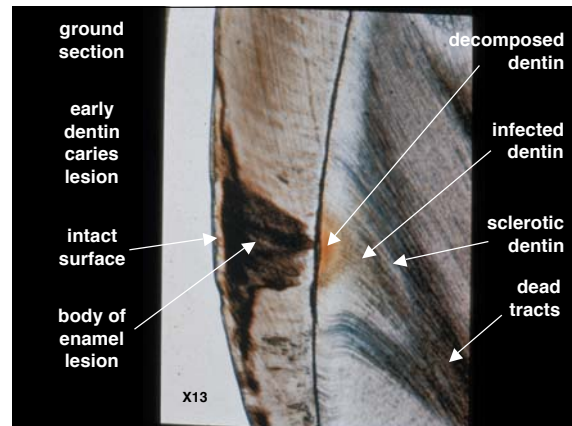
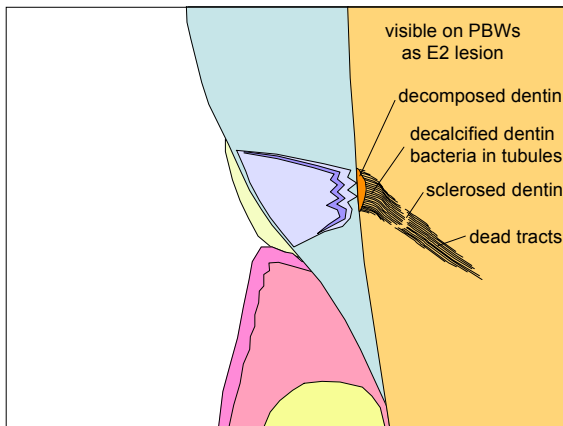


MS too small to be removed by brushing & flossing



For this reason, debriding procedures alone will not prevent decay

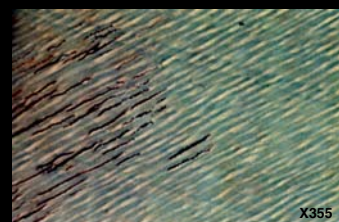




Dentinal Lesion

- decay progresses slowly through enamel & quickly through dentin
- enamel is 99% mineral, whereas dentin is a living tissue with 30% organic content
- salivary buffers are more potent at the enamel surface than deeper in the dentin
- dentinal lesion is more isolated from the diluting effects of the saliva
- in dentinal lesion low pH is more steady
- this selects more strongly for aciduric organisms (LB)
- low pH demineralizes dentin & denatures collagen (gelatin)
- proteolytic organisms increase in prominence

demineralization softens dentin & enlarges tubules



Gram stain

pioneering bacteria enter tubules & reproduce
each tubule contains a bacterial micro-colony

demineralization continues, softening intertubular dentin



Gram stain

bacteria begin to spread laterally from the dentinal tubules

invasion and destruction of dentin is not uniform
demineralization of matrix occurs unevenly



infected tubule with localized destruction of surrounding
intertubular matrix forming micro-cavities

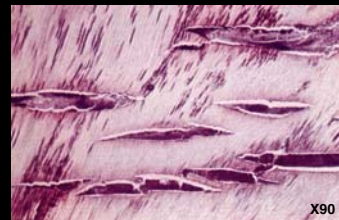
larger micro-cavities form in tubules as surrounding
dentin softens and distorts



X355

filling with breakdown products of the dentin matrix &
proliferating bacteria

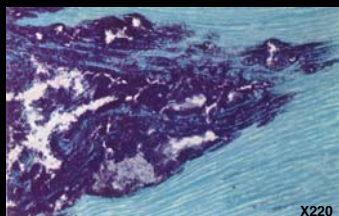
transverse clefts open up perpendicular to dentinal tubules
probably following incremental growth lines
& fill with breakdown products & bacteria



X90

macroscopically dentin becomes leathery
pieces are easily peeled away by an explorer

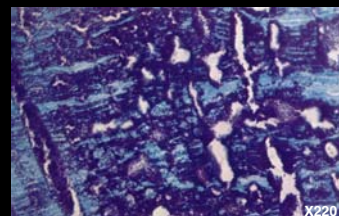
increasing proteolytic bacteria activity tears the
demineralized matrix apart



Gram stain

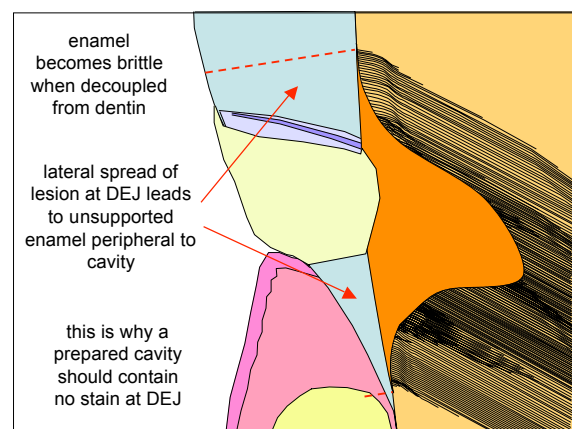
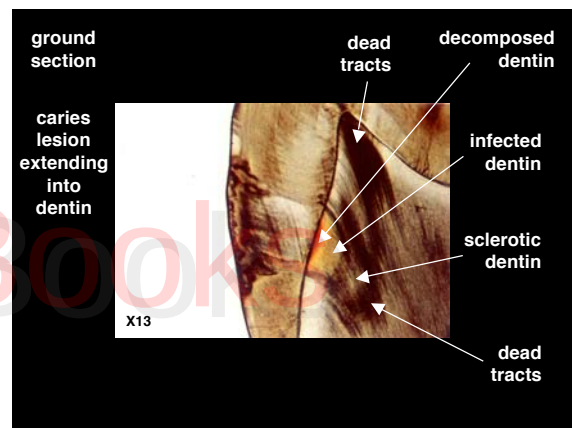
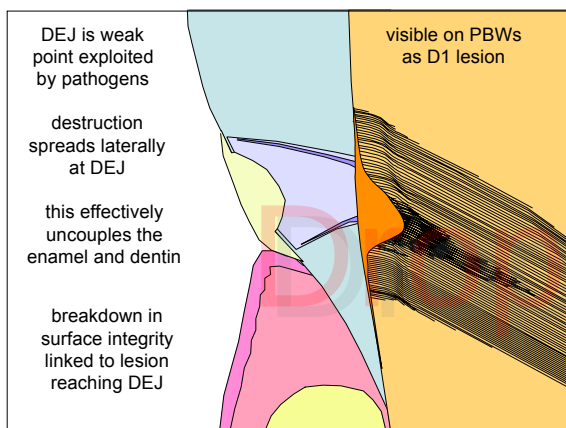
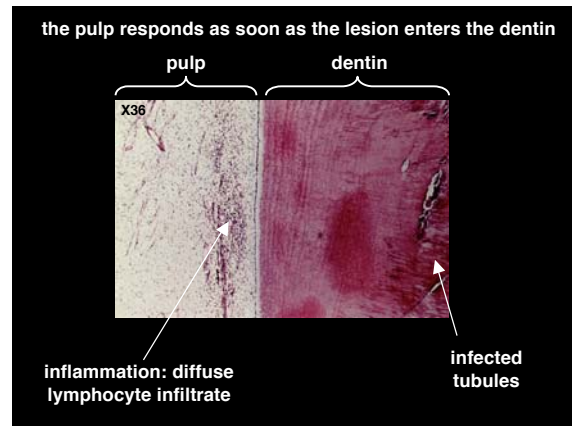
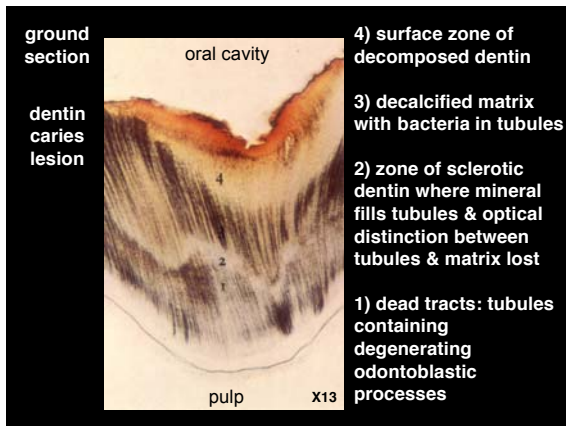
extensive areas of tissue breakdown form

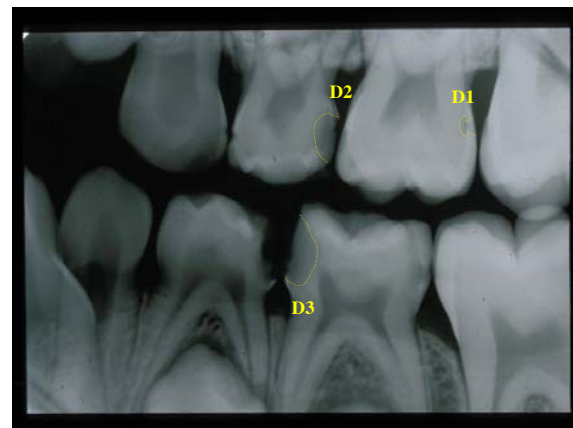
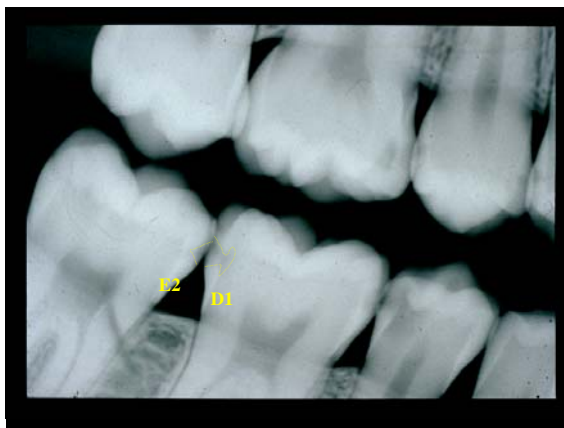
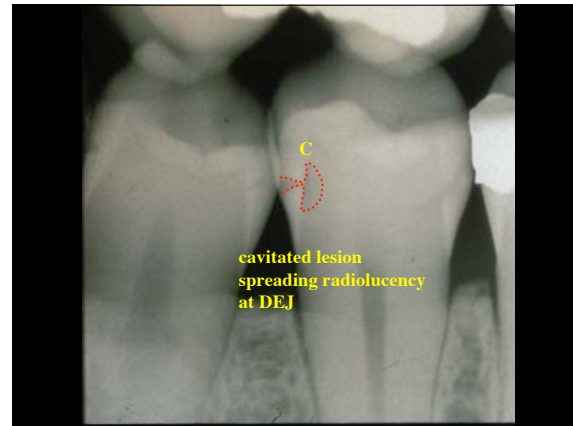
until finally only traces of recognizable dentin tissue
remain

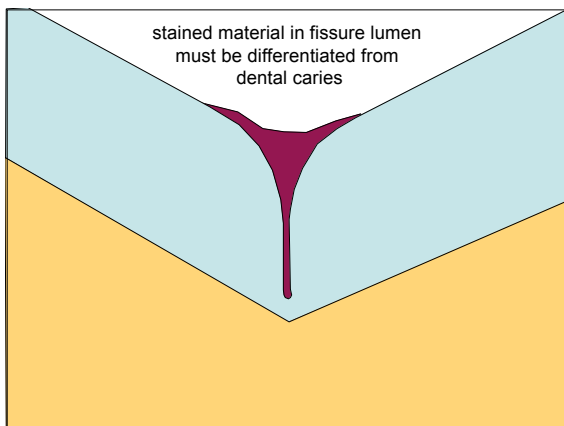
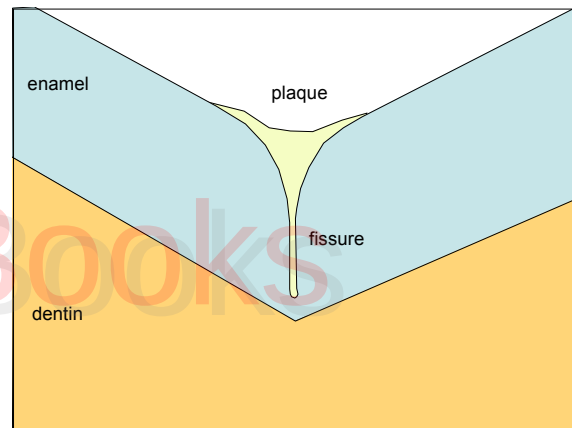
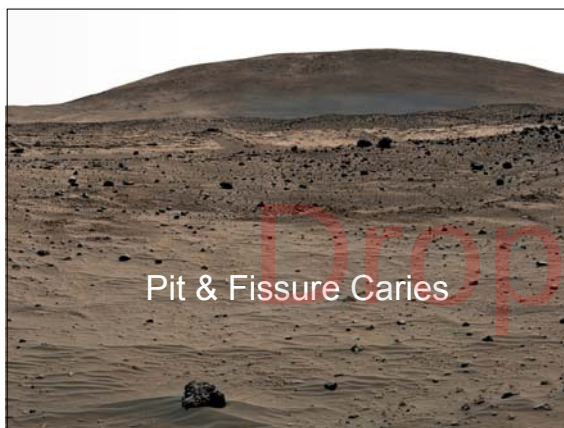
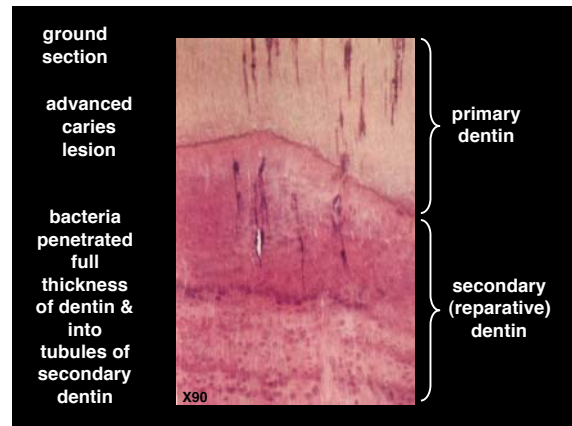
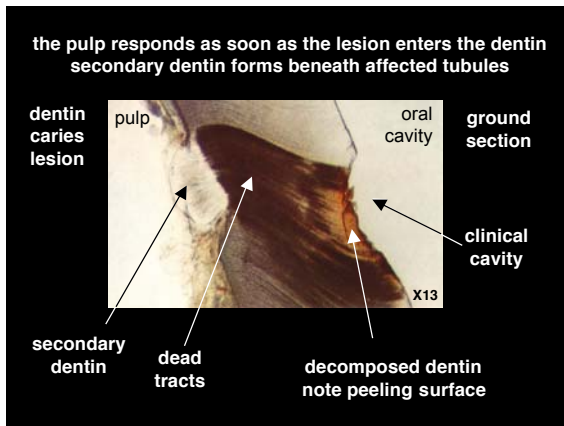


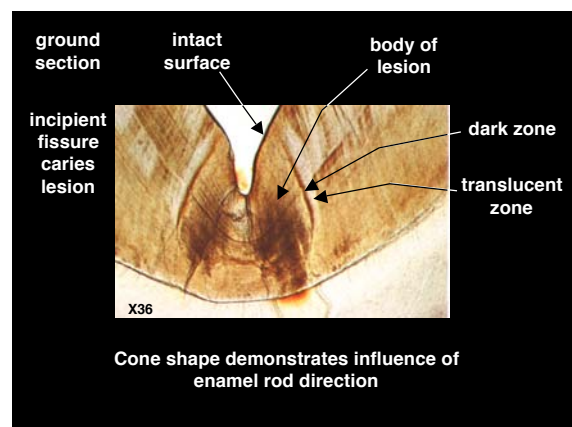
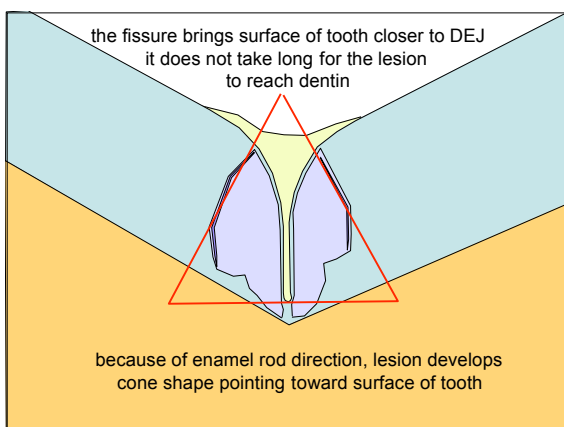
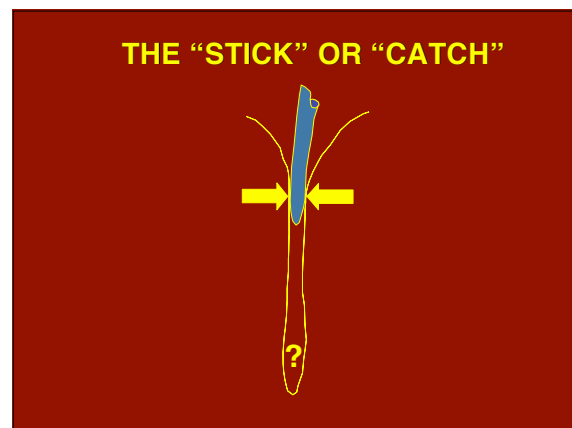
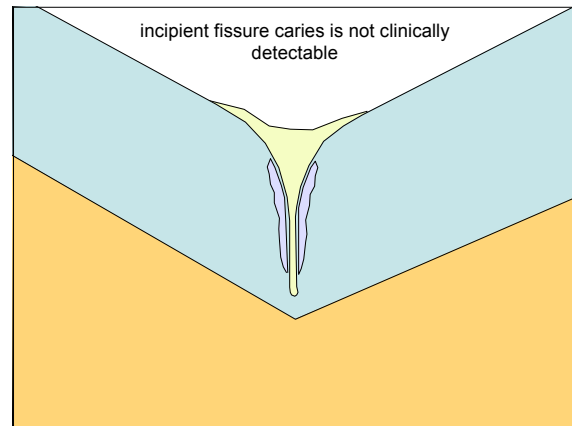
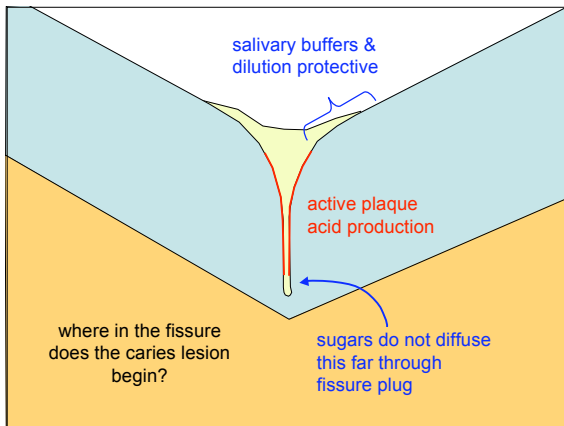
Gram stain

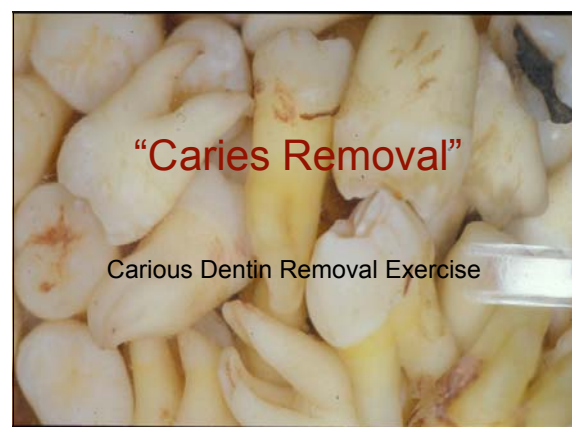
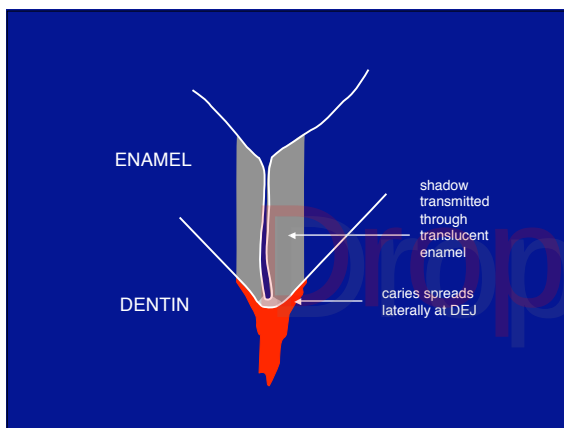
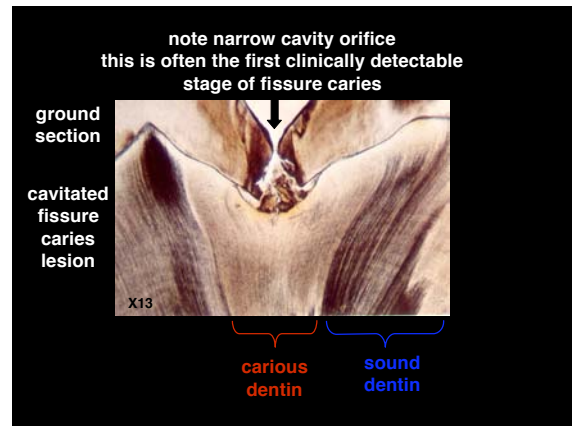
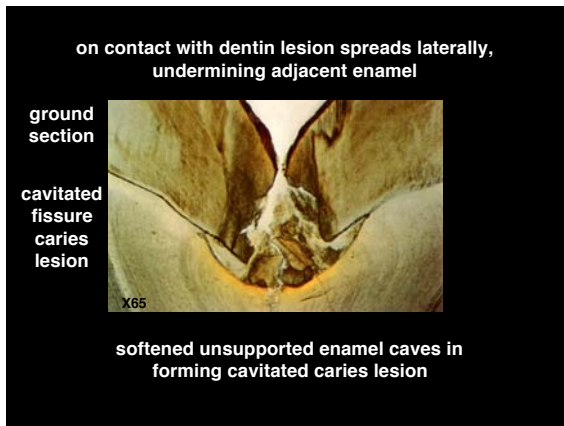
saprophytic micro-organisms help complete destruction













Objectives

- *identify* carious and sound tooth tissue
- *remove* infected tooth tissue
- *establish* sound dentoenamel junction
- *develop* surgical precision in what amount of caries affected tissue must be removed and what should be allowed to remain

Surgical removal of infected dentin

Accepted Terminology	Jargon
• excavating carious dentin	• chasing caries
• removing carious dentin	• removing caries
	• "caries removal"

HUMAN TISSUE BIOHAZARD



- FACE MASK
- SAFETY GLASSES
- SURGICAL GLOVES
- SAFEGUARD AGAINST SKIN PUNCTURE OR LACERATION
- DISPOSE OF TEETH IN BIOHAZARD CONTAINER

CHOOSE THE LARGEST CARIES LESION YOU CAN FIND
INCIPIENT LESIONS WILL NOT DO



HAVE BENCH INSTRUCTOR APPROVE CHOICE



MOUNT IN SMALL AMOUNT OF PLASTER TO SIMPLIFY HANDLING

#245 bur
highspeed
light touch



